R E M A R K S

Reconsideration of this application, as amended, is respectfully requested.

THE TITLE

The title has been amended to more clearly indicate the nature of the invention to which the claims are directed, as required by the Examiner.

THE SPECIFICATION

The summary of the invention has been amended to better accord with the amended independent claim 1. In addition, the specification has been amended at page 31, line 16 to correct a translation error, as supported by the original international application. No new matter has been added, and it is respectfully requested that the amendments to the specification be approved and entered.

THE CLAIMS

Claim 1 has been amended to recite that the image capturing unit comprises an illuminating light source including a plurality of light-emitting devices which respectively emit illumination lights having a plurality of different characteristics of spectroscopic distributions, an image pick-up optical system

which forms an image of a subject illuminated by the illuminating light source, an image pick-up device which picks up the subject image formed by the image pick-up optical system and obtains a subject signal, and a control unit which controls light emission by the plurality of light-emitting devices and image pick-up by the image pick-up device and which switches the image capturing unit between a spectroscopic image capturing mode in which it obtains a still image of a subject spectroscopic image and a moving image capturing mode in which it obtains a moving image thereof. See the disclosure in the specification at, for example, page 19, lines 7-19, page 20, line 24 to page 21, line 8, page 21, lines 18-23, page 26, line 24 to page 27, line 8 and page 81, lines 11-21.

In addition, claim 1 has been amended to recite that in the spectroscopic image capturing mode, the control unit controls the plurality of light-emitting devices to sequentially emit light according to the characteristics of spectroscopic distributions by a plurality of times interlocking the light emission with an exposure timing of the image pick-up device thereby causing the image pick-up device to obtain a plurality of subject spectroscopic images. See the disclosure in the specification at, for example, page 5, lines 16-21, page 19, lines 7-14, page 20, line 24 to page 21, line 5, page 29, line 5 to page 30, line 15.

Still further, claim 1 has been amended to recite that in the moving image capturing mode, the control unit is arranged to: (i) cause light emission of a light-emitting device for a single specific primary color or cause light emission of light-emitting devices for a plurality of specific primary colors selected from the plurality of light-emitting devices, (ii) cause simultaneous light emission of all of the plurality of light-emitting devices, or (iii) cause sequential light emission of a group of R devices, a group of G devices, and a group of B devices selected from the plurality of light-emitting devices, group by group, and to cause the image pick-up device to obtain a moving image. See the disclosure in the specification at, for example, page 19, lines 14-19, page 31, lines 8-21, page 32, line 3 to page 33, line 13, page 34, lines 1-3 and 12-13, page 59, line 15 to page 60, line 10, and page 67, line 4 to page 68, line 11.

Claim 1 has also been amended to recite that the image processing unit comprises an image identification calculating unit which calculates grade data to be used to determine a grade of a color of the subject based on one or more of the subject spectroscopic images captured by the image capturing unit when operating in the spectroscopic image capturing mode. See the disclosure in the specification at, for example, page 41, line 23 to page 42, line 16 and page 82, lines 17-21.

Yet still further, claim 21 has been amended to recite a display unit connected to the image processing unit and that the image identification calculating unit calculates the grade data before and after treatment of the subject, and the display unit displays the grade data calculated before and after the treatment of the subject. See the disclosure in the specification at, for example, page 82, lines 22-24 and page 84, lines 4-5.

It is respectfully submitted that no new matter has been added, and it is respectfully requested that the amendments to the claims be approved and entered.

THE PRIOR ART REJECTION

Claims 1, 17-23, 25-28 and 30-35 were rejected under 35 USC 103 as being obvious in view of the combination of USP 6,201,880 ("Elbaum et al") and WO 02/012847 ("Gill et al"); claim 24 was rejected under 35 USC 103 as being obvious in view of the combination of Elbaum et al and Gill et al, further in view of USP 5,503,559 ("Vari"); and claim 29 was rejected under 35 USC 103 as being obvious in view of the combination of Elbaum et al and Gill et al, further in view of USP 7,144,248 ("Irwin"). These rejections, however, are respectfully traversed with respect to the claims as amended hereinabove.

The present invention as recited in amended independent claim 1 is directed to an image processing system including an

image capturing unit and an image processing unit. As recited in amended independent claim 1, the image capturing unit includes a control unit which switches the image capturing unit between a spectroscopic image capturing mode in which it obtains a still image of a subject spectroscopic image and a moving image capturing mode in which it obtains a moving image thereof. In the spectroscopic image capturing mode, the control unit controls a plurality of light-emitting devices to sequentially emit light according to the characteristics of spectroscopic distributions by a plurality of times interlocking the light emission with an exposure timing of the image pick-up device unit thereby causing the image pick-up device unit to obtain a plurality of subject spectroscopic images. In the moving image capturing mode, the control unit (i) causes light emission of a light-emitting device for a single specific primary color or light-emitting devices for a plurality of specific primary colors selected from the plurality of light-emitting devices, (ii) causes simultaneous light emission of all of the plurality of light-emitting devices, or (iii) causes sequential light emission of a group of R devices, a group of G devices, and a group of B devices selected from the plurality of light -emitting devices, group by group; and controls to cause the image pick-up device unit to obtain a moving image.

Furthermore, the image processing unit includes an image identification calculating unit which calculates grade data to be used to determine a grade color of the subject based on one or more of the subject spectroscopic images captured by the image capturing unit when operating in the spectroscopic image capturing mode. Thus, the image identification calculating unit calculates grade data to be used for determining a color grade of the subject based on at least one spectroscopic image captured by the image capturing unit operating in the spectroscopic image capturing mode in which a plurality of light-emitting devices sequentially emit light according to the characteristics of spectroscopic distributions.

It is respectfully submitted that the cited prior art references do not disclose or suggest calculating grade data to be used to determine a grade of a color of a subject based on spectroscopic image data captured by the image capturing unit operating in the spectroscopic image capturing mode.

Elbaum et al discloses a dental imaging system 10 including an illuminating light source 11, optical fibers capable of selecting spectral bands, optical fibers 14, an electronic camera 24 having CCD imaging array, and a monitor on which computer-calculated numerical measures of selected properties of the image which can assist the dentist in interpretation are displayed (see column 13, lines 37-44). Elbaum et al also discloses providing

visually enhanced representations that help the dentist diagnose, such as wavelet amplitude, phase-representations, iso-intensity contours, line scan profiles (see column 13, lines 8-14). And Elbaum et al also discloses a digital processing unit that compares a current image of a tooth to a previously obtained image of the same tooth to identify changes in the tooth over time, by using, for example, numerical correlation (see column 3, lines 48-52).

In contrast to the claimed present invention, however, Elbaum et al does not disclose any structure that obtains a plurality of subject spectroscopic images (i.e., spectroscopic images of the tooth) in a plurality of image capturing modes, nor any structure which then calculates grade data used to determine the grade of the color of the tooth based on images obtained in one of these different image capturing modes. And it is respectfully submitted that the computer-calculated numerical measures of the selected properties and visually enhanced representations of Elbaum et al are not comparable to the calculated grade data of the claimed present invention because they do not have the same purposes as grade data and are also not based on spectroscopic images.

Gill et al discloses a camera housing assembly including a light source for illuminating an object (see page 5, lines 5-13) and a crown color matching method in which image data is

processed to produce red, blue and green constituent color values. In Gill et al, the color values are analyzed into relative ratios and distribution patterns so as to generate a color map, the map is converted into dental laboratory parameters such as porcelain colors, and a recipe for use to construct a prosthesis/crown is obtained.

In contrast to the claimed present invention, however, Gill et al does not disclose any structure that obtains a plurality of subject spectroscopic images while a plurality of light-emitting devices sequentially emit light according to characteristics of spectroscopic distributions, i.e., during the spectroscopic image capturing mode as according to the present claimed invention.

In further contrast to the claimed present invention, Gill et al does not disclose a plurality of image capturing modes, namely, a spectroscopic image capturing mode and a moving image capturing mode, and a control unit for switching an image capturing unit between these image capturing modes. Therefore, Gill et al cannot disclose calculating grade data to be used to determine the color grade of the subject based on spectroscopic image data captured by the image capturing unit operating in the spectroscopic image capturing mode.

Accordingly, it is respectfully submitted that Elbaum et al and Gill et al (and Vari and Irwin) do not disclose or suggest an image capturing unit or other structure which obtains a plurality

of spectroscopic images and an image processing unit or other structure which calculates grade data to be used to determine a grade of a color of the subject based on one or more of the subject spectroscopic images captured by the image capturing unit when operating in the spectroscopic image capturing mode, as according to the present invention as recited in amended independent claim 1.

In view of the foregoing, it is respectfully submitted that amended independent claim 1 and claims 17-35 depending therefrom clearly patentably distinguish over all of the cited prior art references, taken in any combination consistent with the respective fair teachings thereof, under 35 USC 103.

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Entry of this Amendment, allowance of the claims and the passing of this application to issue are respectfully solicited.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned for prompt action.

Respectfully submitted,

/Douglas Holtz/

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